

# Retrospective analysis of clinical records in 38 cases of recovery from autism

Doreen Granpeesheh, PhD, BCBA  
Jonathan Tarbox, PhD, BCBA  
Dennis R. Dixon, PhD

Center for Autism and Related Disorders  
Tarzana, CA, USA

Edward Carr, PhD

State University of New York at Stony Brook  
Stony Brook, NY, USA

Martha Herbert, PhD

Harvard Medical School  
Massachusetts General Hospital  
Cambridge, MA, USA

**BACKGROUND:** Twenty years of research on early intensive treatment using applied behavior analysis (ABA) for children with autism has consistently produced robust effects. There appears to be a subset of children whose response to intensive ABA treatments includes achieving a level of functioning that is indistinguishable from typically developing peers. The purpose of this study was to describe a subset of children who recovered from autism following intensive ABA interventions.

**METHODS:** We reviewed the clinical files of 38 children with autism who achieved an optimal outcome after receiving intensive ABA services.

**RESULTS:** The mean age at intake was 40 months. Average IQ was 83.6 at intake and 107.9 at discharge. Mean adaptive skills were 68.04 at intake and 88.87 at discharge.

**CONCLUSIONS:** Our study corroborates the finding that some children with autism who receive early intensive behavioral intervention achieve functioning in the average range.

**KEYWORDS:** autism, ASD, recovery, EIBI, ABA

## INTRODUCTION

A significant amount of research over the past 20 years has demonstrated the effectiveness of treatments for autism based on applied behavior analysis (ABA). The most robust treatment effects have been observed when ABA treatments are implemented at a very young age and very intensively. This format of ABA treatment has come to be called early intensive behavioral intervention (EIBI). Although the first study of EIBI was published

### CORRESPONDENCE

Doreen Granpeesheh, PhD, BCBA  
Center for Autism and Related Disorders  
19019 Ventura Blvd, 3rd Floor  
Tarzana, CA 91356 USA

### E-MAIL

D.Granpeesheh@centerforautism.com

more than 20 years ago,<sup>1</sup> there was some concern about a lack of controlled replications published in the years following this initial study.<sup>2</sup> However, beginning in 2000, several more between-group controlled evaluations of EIBI have been published, all of which have demonstrated significant treatment gains (see Rogers and Vismara<sup>3</sup> for a review). Recent reviews of autism treatment research have acknowledged this fact and have consistently recommended EIBI as a treatment approach.<sup>3-5</sup>

Controlled experiments on the use of EIBI for autism have consistently found considerable variability in response to treatment among participants.<sup>3</sup> Although most participants demonstrate a significant response to treatment, some participants respond to a far greater degree. Of particular interest is the observation that a portion of participants achieve functioning in the nonimpaired range on some outcome measures. This outcome has been observed across every controlled study that has implemented EIBI for a minimum of 30 hours per week and for a minimum of 12 months' treatment duration.<sup>1,6-9</sup> The percentage of participants who achieve outcomes in the nonimpaired range vary between studies and between dependent variables. Unfortunately, IQ has been the most commonly used dependent variable in studies on EIBI, and the potential shortcomings of using IQ as a measure of response to a treatment for autism have been discussed elsewhere.<sup>10</sup> Nevertheless, the percentage of participants who achieved an IQ in the average range in EIBI studies that implemented treatment for at least 30 hours per week and for at least 12 months was 47% at the lowest<sup>7</sup> and 57% at the highest.<sup>6</sup>

Several EIBI studies have reported the type of school placement in which participants are succeeding at the termination of the study as an outcome variable—the optimal outcome being placement in regular education, without any specialized supports. Although there are several limitations to this dependent variable,<sup>10</sup> the social significance of success in regular education, without specialized supports of any kind, is clearly substantial. The percentage of participants in controlled studies that have implemented a minimum of 30 hours per week of EIBI, for a minimum of 12 months, and that have reported this measure of outcome has ranged from 28% at the lowest<sup>6</sup> to 47% at the highest.<sup>1</sup> Perhaps most encouraging is the finding that a percentage of participants demonstrate scores on diagnostic assessments that fall in the non-autism spectrum disorders (ASD) range. Only 2 con-

trolled studies of EIBI have included diagnostic assessments as measures of outcome, but the results of both are encouraging. In one study, 34% of participants (N = 24) scored in the non-ASD range on the Autism Diagnostic Interview, Revised (ADI-R),<sup>8</sup> whereas in the other study, 21% of participants (N = 20) scored in the non-ASD range on the Autism Diagnostic Observation Schedule (ADOS).<sup>9</sup> **TABLE 1** depicts the percentage of participants in EIBI outcome studies (top, controlled studies; bottom, uncontrolled studies) who scored in the nonimpaired range on various outcome measures. The appearance of NA (not applicable) in a cell denotes the absence of a measure in that particular study, whereas the appearance of NR (not reported) indicates that the measure was included in the study but the authors did not report the percentage of participants who attained a score in the average range on that measure. Note that only one published controlled study of at least 30 hours per week for a minimum of 12 months of EIBI did not report the percentage of participants who achieved nonimpaired functioning on any measure.<sup>11</sup>

Several uncontrolled studies have also reported children achieving functioning in the nonimpaired range on various measures after receiving EIBI. Harris and Handleman<sup>12</sup> reported that 34% of the children who participated in their EIBI program (N = 27) achieved an IQ in the average range posttreatment and that 11% were succeeding in regular education without specialized supports. Weiss<sup>13</sup> reported that 55% of the children treated in one study (N = 20) scored in the average range on the Adaptive Behavior Composite (ABC) scale of the Vineland Adaptive Behavior Scales (VABS) and that 45% scored in the clearly nonautistic range on the Childhood Autism Rating Scale (CARS) posttreatment. In a province-wide evaluation of the effects of a free, public EIBI program for 332 young children with autism in Alberta, Canada, 34% of children scored in the non-ASD range on the CARS posttreatment.<sup>14</sup> In a retrospective evaluation of children whose parents had reported recovery from autism following EIBI treatment, 4 of 8 were found to have an IQ in the average range; however, 7 of 8 still had delays in language.<sup>15</sup> A recent meta-analysis conducted by Reichow and Wolery<sup>16</sup> concluded that EIBI is an effective intervention for many children with autism, ie, many children (35%) across the studies in their analysis were placed in typical classrooms following intervention.<sup>16</sup> Further, their analysis found that 18% of participants across the included studies met criteria for diagnostic reclassification.

**TABLE 1****Dependent variables in the nonimpaired range post-EIBI treatment**

Study	Dependent variable <sup>a</sup>					
	IQ	VABS ABC	Diagnostic	Language (expressive)	Language (receptive)	School placement
Controlled						
Lovaas, 1987 <sup>1</sup>	47%	NA	NA	NA	NA	47%
Sallows et al, 2005 <sup>8</sup>	48%	NR	NR	NR	NR	48%
Howard et al, 2005 <sup>7</sup>	45%	NR	NR	69%	72%	NA
Cohen et al, 2006 <sup>6</sup>	57%	38%	NA	43%	38%	29%
Remington et al, 2007 <sup>11</sup>	NR	NR	NR	NR	NR	NR
Zachor et al, 2007 <sup>9</sup>	NR	NA	20%	NA	NA	NA
Descriptive (uncontrolled)						
Harris et al, 2000 <sup>12</sup>	44%	NA	NR	NA	NA	11%
Perry et al, 2008 <sup>14</sup>	NR	NR	34%	NA	NA	NA
Weiss, 1999 <sup>13</sup>	NA	55%	45%	NA	NA	35%

EIBI: early intensive behavioral intervention; NA: measure absent; NR: measure not reported; VABS ABC: Vineland Adaptive Behavior Scales Adaptive Behavior Composite score.

<sup>a</sup>Percentage of participants scoring in the nonimpaired range.

It seems clear from the research described above that a percentage of children with ASD who receive EIBI for at least 30 hours per week and for at least 1 year achieve functioning in the average range, at least in some domains. Lovaas<sup>1</sup> described the participants in his study who achieved the greatest gains as having recovered from autism. Since then, few have used the term “recovery” in their published work. Others have referred to participants achieving functioning in the nonimpaired range post-EIBI treatment as achieving “learning recovery,”<sup>15</sup> or have labeled the children who achieve such outcomes “rapid learners.”<sup>8</sup> The concept of recovery from autism is a controversial one, and a comprehensive treatment of this concept is beyond the scope of this article. Nevertheless, we will briefly outline our basic position.

The DSM-IV-TR states that a mental disorder is “conceptualized as a clinically significant behavioral or psychological syndrome or pattern that occurs in an individual and that is associated with present distress (eg, a painful symptom) or disability (ie, impairment in one or more important areas of functioning) or with a significantly increased risk of suffering, death, pain, disability, or an important loss of freedom.”<sup>17</sup> Our defi-

nition of recovery from an ASD is in line with the definition of disorder quoted above and is quite simple: the individual who once had a clear ASD diagnosis no longer demonstrates impairment in his or her everyday life. Over the past 18 years of providing treatment at the Center for Autism and Related Disorders (CARD), we have observed numerous cases of children with clear-cut ASD diagnoses achieving nonimpaired functioning across all aspects of their daily lives after receiving EIBI. Indeed, many are currently attending high school or college in a completely typical manner, with no supports of any kind, ie, they are succeeding socially, academically, and otherwise in an entirely unmodified environment.

If and when recovery by our definition occurs, a separate but equally critical issue is how to measure that recovery. Valid and reliable measurement is a critical prerequisite for clinical treatment evaluation, let alone for meaningful scientific inquiry. We have previously proposed that a reasonable metric of recovery should include all of the following: (1) the loss of eligibility for an ASD diagnosis, according to a rigorous clinical interview by a qualified and experienced diagnostician, (2) scores in the average or above-average range on

**TABLE 2****Mean IQ and VABS ABC scores at intake and post-EIBI treatment**

Measure	Mean	SD	Range	Mean increase in score
Age at intake	40.32 mo	7.27	24 to 55 mo	–
IQ				
Start	83.6	19.15	50 to 133	
Exit	107.9	9.59	89 to 128	24.24
VABS ABC				
Start	68.04	7.79	57 to 82	
Exit	88.87	11.02	69 to 111	20.83

EIBI: early intensive behavioral intervention; VABS ABC: Vineland Adaptive Behavior Scales Adaptive Behavior Composite score.

standardized tests of intelligence, language, socialization, and generalized adaptive functioning, and (3) achieving passing grades in a regular education placement, without specialized supports of any kind.<sup>18</sup>

Subsequently, one other published paper has addressed the issue of recovery from autism directly. In a thoughtful and thorough discussion on the issue of recovery, Helt et al<sup>19</sup> propose the following criteria as a definition of recovery from autism:

(1) the child was diagnosed with an ASD in early childhood (ie, by age 5) by a specialist (ie, someone whose practice is at least 50% devoted to autism), (2) there was early language delay (either no words by 18 months or no word combinations by 24 months), (3) review by one member of our team, blind to current group membership, of early reports (age 2 to 5) and/or videotapes, with diagnostic formulations elided, confirms early ASD.

By current functioning: (1) the participant does not meet criteria for any pervasive developmental disorder, including PDD-NOS (at least one symptom in social domain plus one additional symptom), which generally means that no social symptom of ASD is present by best clinical judgment, (2) the participant does not meet ASD cutoff on social or communication domain of the ADOS, (3) any special education services the participant receives are to remediate difficulties with attention, organization, or specific academic difficulties and not to address features of autism, (4) the participant is functioning without an individual assistant in a

regular education classroom, (5) verbal IQ (VIQ), performance IQ (PIQ), and full-scale IQ (FSIQ) are all at 78 or above (1.5 standard deviations below average), (6) Vineland Communication and Socialization Scales are all at 78 or above.<sup>19(p340)</sup>

The Helt et al<sup>19</sup> definition of recovery is similar to the one we propose. Although it requires more verification of history (ie, blind review of charts), it is similar in that it requires ineligibility for any ASD diagnosis and success in regular education, without any specialized supports.

Regardless of one's position on the issue of recovery from autism, some proportion of children with autism who receive EIBI achieve functioning in the nonimpaired range on some measures. Although this finding has become common in studies of EIBI, little previous research has attempted to describe the characteristics of a substantial group of the children who achieve these outcomes. In light of the significant amount of evidence supporting EIBI as an effective treatment for ASD, the aim of this study was not to provide more evidence in support of EIBI. Rather, the purpose was to conduct a retrospective chart review for the purpose of obtaining descriptive data on characteristics, duration and intensity of treatment, and outcome for a group of children previously diagnosed with an ASD who received community-based ABA treatment and subsequently achieved nonimpaired functioning.

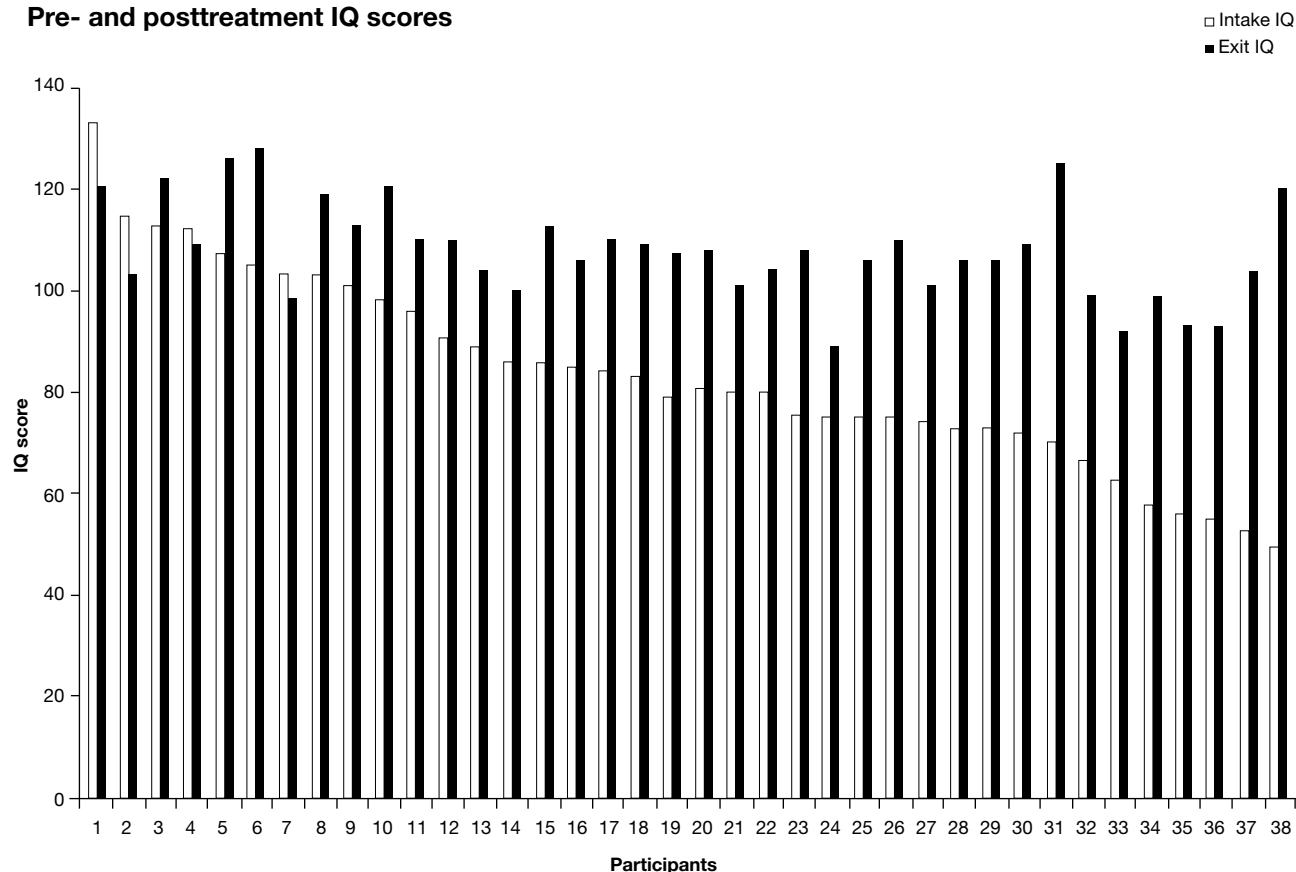
## METHODS

### Treatment

All patients whose charts were reviewed for this study received EIBI services from CARD. Services were customized for each individual child but generally followed the format for comprehensive EIBI programs described in published treatment manuals.<sup>20-22</sup> One significant difference between the treatment approach described in these manuals and that which the patients in this study experienced was the scope of the CARD curriculum. The CARD curriculum directly addresses "higher-order" social cognition and executive skills to a greater degree than is described elsewhere; however, space does not permit a full elaboration here.

### Participants

Patient charts were selected for inclusion in this study based on interviews with senior clinicians in our

**FIGURE 1****Pre- and posttreatment IQ scores**

organization. Senior clinical staff were interviewed and asked to identify past patients who, in the time period 1995-2007, achieved age-appropriate functioning and no longer required supports of any kind after discharge. Our criteria were that patients (1) no longer presented with developmental delay in any area of functioning of which we were aware, (2) were placed in regular education classrooms and were earning passing grades without any special assistance and, therefore, (3) the reason for discharge from our treatment was the absence of any apparent need for treatment. In addition, agreement on these criteria between a minimum of 2 senior clinicians who were familiar with the course and outcome of a patient's treatment was required for inclusion in the study. A list was tabulated of all patients identified through this process, and this list was used for the chart review phase of the study. All patients had diagnoses of either autistic disorder or pervasive developmental disorder not otherwise specified (PDD-NOS), given by psy-

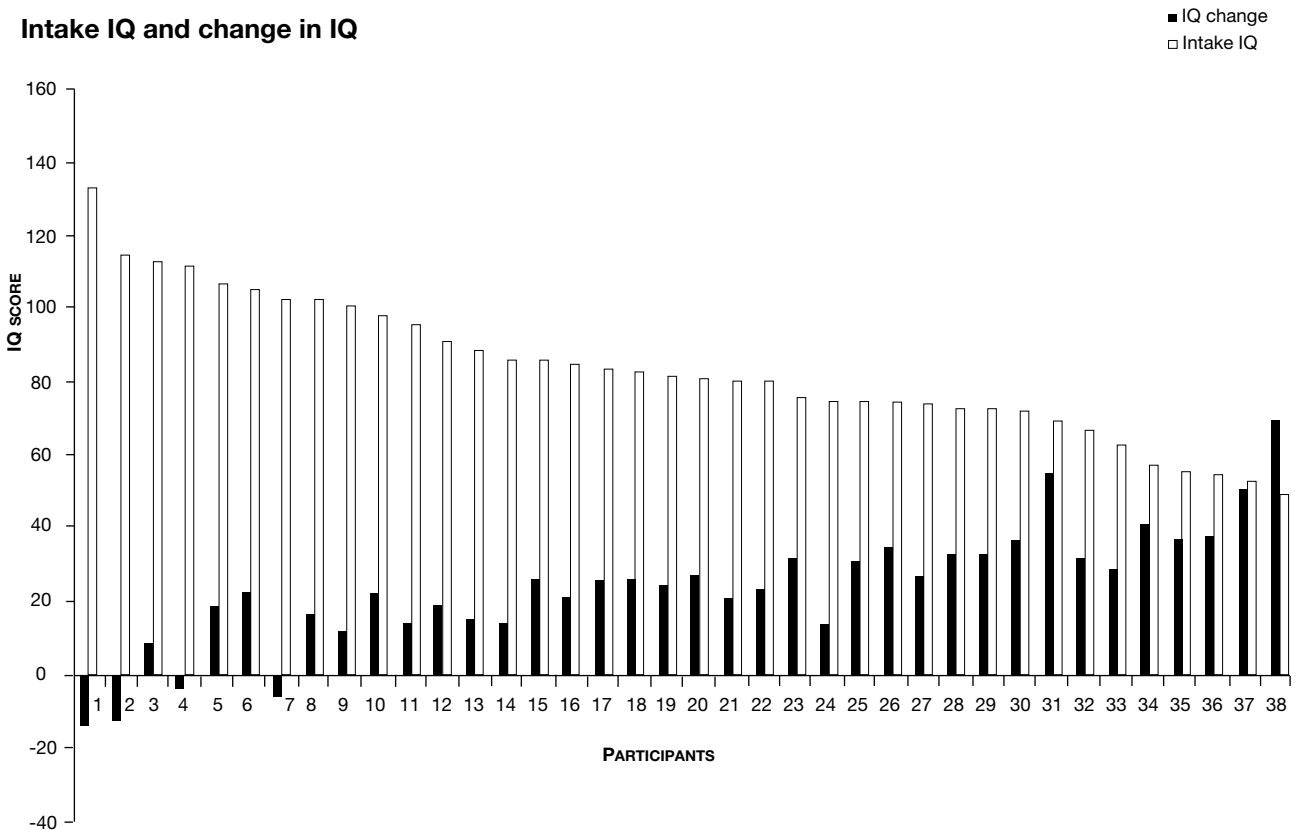
chologists or physicians who were independent of our organization, prior to initiating treatment with us.

### Chart review

A total of 204 names were identified for the chart review. All available clinical records were obtained for clients identified through the participant selection phase. All records were searched for the following information: intake evaluation reports, discharge summary reports, standardized testing results, quarterly clinical summary reports, and summaries of any evaluations done internally or outside our clinic. To be included in this study, patient records had to contain cognitive testing within 6 months of the start of ABA services and within 6 months of stopping ABA services.

### Final clinician interview

All patients for whom the required information was available were included in the final stage of the review

**FIGURE 2****Intake IQ and change in IQ**

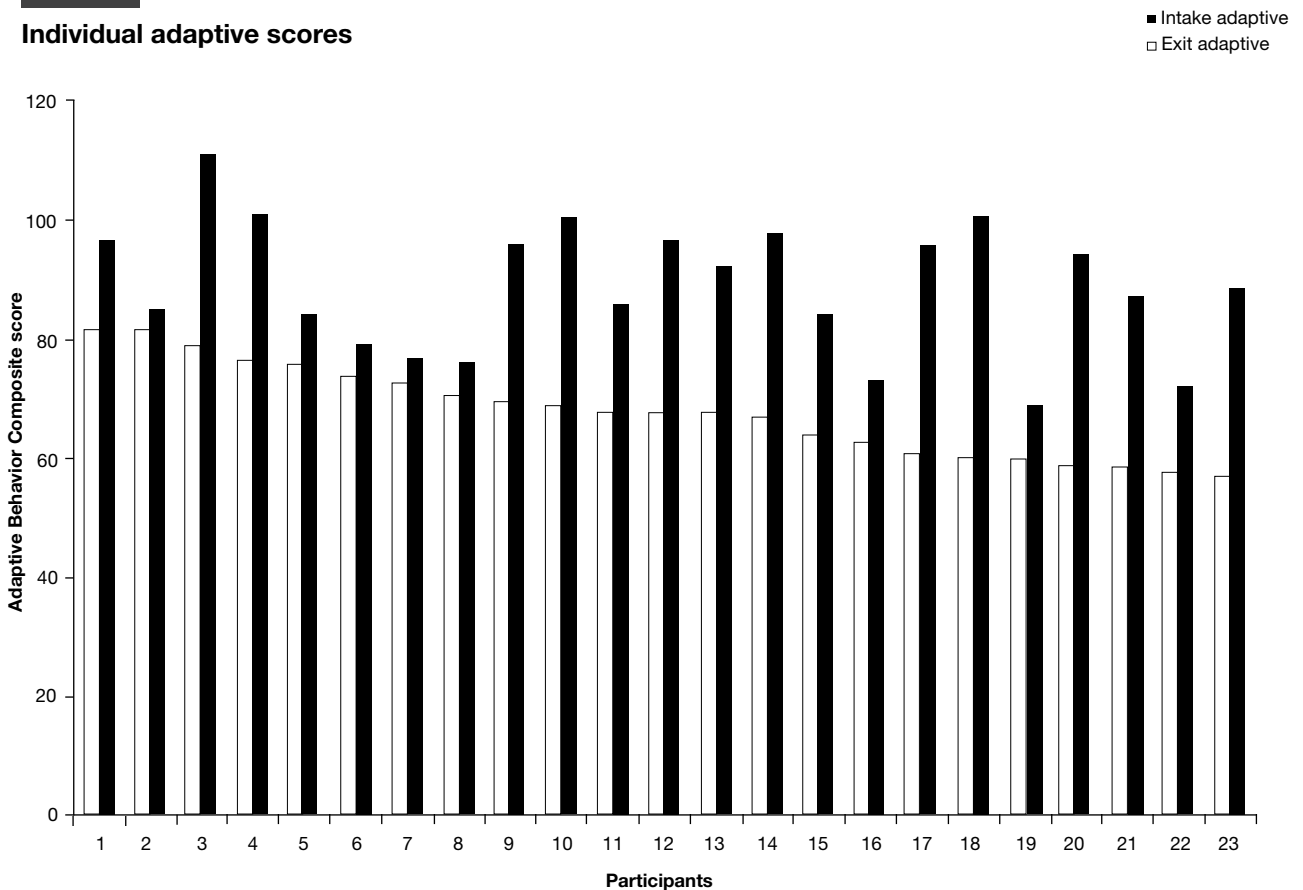
process. The final stage consisted of a clinician interview wherein the supervising clinician who treated the child at the time of discharge was asked to recall any information that may have suggested that a patient still had clinically significant impairment in any area of functioning.

## RESULTS

The chart review phase of the study yielded 38 patients whose records included results of cognitive testing before treatment was initiated and after treatment was terminated. The cognitive assessment tools used to produce the IQ scores that were present in patient files were the tools used by the many outside assessors who conducted the tests and therefore included a wide range of tests, including the Wechsler Preschool and Primary Scale of Intelligence, Wechsler Preschool and Primary Scale of Intelligence-Revised, Wechsler Preschool and Primary Scale

of Intelligence-Third Edition, the Wechsler Intelligence Scale for Children-Third Edition, the Stanford-Binet Intelligence Scale-Fourth Edition, the Merrill-Palmer Scale of Performance, the Leiter Intelligence Performance Scale-Revised, the Mullen Scales of Early Learning-AGS Edition, the Bailey Scales of Infant Development-II, and the Differential Ability Scales-First Edition. **TABLE 2** depicts patient characteristics regarding age, IQ, and VABS ABC score at intake and post-EIBI treatment. Although 58% of patients had an IQ below 85 at intake, all patients had a minimum IQ of 89 at discharge (mean increase of 24.24 points). The mean VABS increased 20.83 points, from 68.04 at intake to 88.87 at discharge.

**FIGURE 1** depicts pre- and posttreatment scores, with IQ score depicted on the vertical axis and individual participants on the horizontal axis. Because one of the inclusionary criteria of the study was an IQ score in the average range at discharge, all patients demonstrated an IQ at or above 85 at discharge. Patients' individual changes in IQ varied significantly, however. **FIGURE 2**

**FIGURE 3****Individual adaptive scores**

depicts intake IQ scores and the magnitude of IQ change over the course of treatment for each individual patient. The magnitude of change in IQ was inversely related to the IQ at intake ( $r = -0.865$ ;  $P < .01$ ), ie, the higher the intake IQ, the smaller the IQ gains observed posttreatment.

The charts of 23 of the 38 patients contained pre- and posttreatment VABS scores. **FIGURE 3** depicts VABS ABC scores at intake and at discharge. Posttreatment, 16 of 23 patients achieved VABS scores at or above 85, suggesting general adaptive functioning in the average range.

## DISCUSSION

Our findings appear to corroborate the general finding from previous studies that some children with an ASD who receive early intensive ABA treatment achieve typical functioning.

These data provide the first relatively large-scale description of the characteristics of individuals who achieve an optimal outcome.

Participants in this study began treatment with a relatively high IQ (average of 84), and it is possible that this fact contributed to recovery. However, several patients in this study began treatment with a very low IQ (50), suggesting that a high pretreatment IQ may not be a necessary condition for recovery using EIBI treatment. Also interesting to note is the fact that participants 1 and 2 demonstrated relatively large (nearly 15-point) decreases in IQ scores from pre- to posttreatment. Both participants' IQs remained in the average or above average range, so this decrease was likely not a clinically significant finding, but it is nonetheless a curious finding. At least 2 possible explanations are apparent. First, it is possible that this decrease simply constitutes regression to the mean. Second, it is possible that their pretreatment IQ scores were inaccurate, due to the



type of test or scoring procedure used. Further research is clearly needed to conclusively determine the impact of pretreatment IQ on outcome; this research should include large sample sizes, consistent measures of IQ between patients, and a closely matched control group and should control carefully for age at intake and number of treatment hours during intervention.

Patients in this study began treatment at a relatively young age (average of 3 years, 4 months), which may have contributed to the optimal outcomes obtained. However, no attempt was made to compare the current data with those of children who did not achieve non-impaired functioning, so it is not possible to determine whether the children in this study did indeed start treatment at a younger age than those who did not recover. No previous research has systematically attempted to evaluate the effects of age at intake on outcome, but the implications of previously published studies are not entirely consistent. For example, in their descriptive study, Harris and Handleman<sup>12</sup> found that age at intake seemed to predict outcome, but Eikeseth and colleagues<sup>23</sup> achieved very significant treatment effects with children who were slightly older at intake (age 4 to 7). Again, more carefully controlled research is clearly needed to identify what influence age at intake has on the likelihood of recovery from autism. Such research would benefit from including large sample sizes, groups of children ranging in age from 18 months to 7 years, and patients with carefully matched IQ scores between groups at intake.

As with all retrospective chart reviews, our study comes with several caveats. First, it should be noted that retrospective chart review is an uncontrolled form of treatment research. No attempt was made to introduce any semblance of experimental design or control; therefore, no claims can be made regarding causality. However, in light of the substantial literature supporting EIBI treatments for autism, it seems reasonable to infer that EIBI contributed to the positive outcome of the patients described in this study. Nevertheless, several points warrant further discussion.

First, because our study lacks a control group of participants who did not receive EIBI, it is impossible to evaluate whether the patients in this study would have recovered from autism without EIBI. However, this possibility seems unlikely, given that no previous study has reported the spontaneous recovery of a substantial number of children with autism. In fact, most research

has demonstrated that ASD diagnoses are quite stable over time.<sup>24,25</sup>

Second, it is possible that the children in this study did not actually recover from autism, ie, significant residual autism symptomatology remained after discharge. Although this is a possibility, it seems unlikely. Senior clinicians who were highly familiar with the patients' cases reported that all patients were succeeding in their regular educational settings, homes, and social lives, without any specialized supports. Although clinician verbal report is no substitute for hard data, it is unlikely that the report of a large number of experienced clinicians would be erroneous. In addition, the children who participated in the study continue to do well socially and academically in mainstream environments, with no reports of concerns from their families and no notification of diagnostic concerns from teachers, physicians, or other professionals who are in contact with the children on a day-to-day basis. Nevertheless, future research on recovery from autism should include well-established diagnostic outcome measures, such as the ADOS and ADI-R, at discharge.<sup>10</sup>

Third, it is possible that the patients described in this study never had an ASD. For example, it is possible that they simply suffered from a mild form of nonspecific developmental delay and, therefore, their age-appropriate level of functioning at discharge simply reflected the absence of an ASD from the start, rather than the effect of their ABA therapy. All patients described in this study were diagnosed by medical doctors or psychologists independent of CARD, or any of the authors of this paper, prior to initiating treatment with CARD. On one hand, this is a strength of the study, because their diagnoses could not have been due to investigator bias. On the other hand, this is a potential limitation of the study because, given the current data, it is not possible to confirm patient diagnoses with certainty. However, it is unlikely that a significant number of the patients in this study did not have an ASD at intake for at least 2 reasons. First, many of the diagnoses were given by clinicians who were either directly employed by or contracted with the third parties that funded the ABA therapy provided by CARD. Therefore, at least from a financial perspective, at least one source of bias would be *against* giving an ASD diagnosis, not for it. Second, a standard part of our clinical intake process is a thorough evaluation of all areas of functioning, particularly focusing on language, socialization, and the presence of repetitive behavior. In



cases where a new patient is not found to have significant clinical impairment in all 3 areas, we do not recommend ABA services. Such was not the case for any of the patients described in this study. Nevertheless, future research documenting recovery from autism should include well-established, standardized diagnostic measures at intake, such as the ADOS and ADI-R.

Another potential limitation to the inclusion of results from IQ tests is the possibility that the pretreatment IQ tests were not an accurate measure of the child's intelligence. Children with ASD often exhibit noncompliance and may be difficult to test, and it is possible that EIBI simply produced better compliance with testing, thereby allowing the child's true level of intelligence to be assessed in the post-EIBI IQ test. If this were the case, scores on the post-EIBI IQ tests would simply reveal true IQ and would not represent the effects of EIBI treatment. Although it is impossible to rule out this interpretation with the current data, the concomitant increases in VABS scores observed across patients provide at least tentative evidence to the contrary. Given that the VABS is an indirect measure and that significant increases in VABS were seen, it seems unlikely that the increases in IQ scores were simply due to increases in child compliance that would not, in themselves, increase VABS scores.

An additional concern with the current study is that only a small portion of patients (38 of 204) had usable data in their charts. Unfortunately, it is not possible to determine whether the 38 individuals studied comprise a representative sample of the 204 patients originally identified through clinician interview. However, there is no compelling reason why the presence of testing data in patient charts would systematically bias the data in one direction or another. In addition, the current data are not being described as a representative clinical sample—they are simply the data that were present in the charts and must be interpreted as such. Nevertheless, future research on recovery from autism should be designed prospectively to include a larger portion of the total sample under consideration.

Another caveat to this study is that participant inclusion depended largely on clinician recall, which can be unreliable and subjective. There are many factors that may have influenced clinician recall, not least among them being a simple recall bias for successful cases. Although steps were taken to reduce this possibility, such as confirming each clinician's report by checking it against a minimum of one other clinician who was

familiar with the case, these data should nevertheless be interpreted cautiously.

Some discussion of children who do not achieve optimal outcomes may be warranted. Most or all published studies of EIBI for children with ASD have demonstrated that some children achieve smaller gains than do others. No research has yet been published that has been able to conclusively predict which children respond most favorably to EIBI and which do not. Therefore, at the current time, the safest recommendation is likely that all children with ASDs receive EIBI, since it is the most empirically supported treatment. However, like any intervention, EIBI must be accountable for its effectiveness and, therefore, ongoing evaluation of the effects of EIBI with each individual patient must always be conducted. Although it has not been investigated, it is possible that children who respond less favorably to EIBI may respond more favorably to other intervention approaches. In individual cases in which EIBI has been documented to not produce clinically significant outcomes for a child (and factors such as treatment integrity and treatment intensity have been ruled out), it may well be justifiable to implement a different treatment approach, while also subjecting such an approach to equal levels of empirical scrutiny. Furthermore, future research is needed that compares EIBI to other treatment approaches and relates differential outcomes to participant variables in order to determine the optimal treatment for each child.

The implications of the current study for early intervention also warrant brief discussion. On one hand, the mean age of the patients at intake was relatively young (3 years, 4 months). On the other hand, recent research has suggested that ASD can be detected at a younger age than previously thought,<sup>26,27</sup> and although controlled investigations of age effects on treatment outcomes are lacking, preliminary analyses of age effects suggest that initiating treatment as early as possible is likely to enhance outcomes.<sup>28,12</sup> Therefore, although the outcomes reported in this study are favorable, it is possible that they could have been more favorable if treatment had begun at an earlier age, ie, a larger number of children may have recovered or the same number of children may have completed treatment more quickly or efficiently. Of course, no data in the current study allow for an empirical evaluation of this possibility, so it must be considered purely speculative at this time. Future research on recovery from autism should therefore attempt to implement treatment earlier in order to evaluate this possibility.

The importance of early intervention naturally points to the importance of early detection. Some clinicians still hold the belief that it is “normal for boys to start talking late” and their inclination to dissuade mothers from anxiety concerning their child’s development may lead to a delay in referral to an expert in ASD diagnosis. However, autism diagnosis from age 2 to 9 has been shown to be very stable<sup>27</sup> and children who are identified at age 2 as having language and social problems rarely “grow out of it.”<sup>26</sup> Given the large gains that can be made when treatment is implemented early and effectively, clinicians would do well to identify potential warning signs of ASD as early as possible. To this end, more training is clearly needed for pediatricians in early screening and diagnosis.

## CONCLUSIONS

This study presents descriptive data for patients who were identified as recovering from an ASD. These patients started treatment at a young age (mean = 3 years, 4 months), were relatively high in IQ at intake (mean = 84), made very significant gains in IQ (mean = 24.2), and made gains in general adaptive functioning as measured by the VABS (mean

= 20.8). However, the lack of experimental design—a concern inherent in retrospective analyses—and the use of clinician judgment must be considered when interpreting these data. Further research is needed on factors that predict and influence recovery from autism. Future studies should include standard experimental designs and systematic measurement of client functioning level, including language, social skills, and gold-standard diagnostic instruments (eg, ADOS). Finally, clinicians are advised to be particularly vigilant with respect to early detection of ASDs, so that the maximum number of children with ASDs can access treatment at as young an age as possible, thereby optimizing treatment outcomes. ■

**ACKNOWLEDGEMENTS:** We thank the hundreds of clinicians whose work contributed to the outcomes of the patients described in this study, and we thank Catherine Peters for her help in coordinating the chart review process.

**DISCLOSURES:** The authors report no financial relationship with any company whose products are mentioned in this article or with manufacturers of competing products.

## REFERENCES

1. Lovaas OI. Behavioral treatment and normal educational and intellectual functioning in young autistic children. *J Consult Clin Psychol.* 1987;55:3-9.
2. Rogers SJ. Empirically supported comprehensive treatments for young children with autism. *J Clin Child Psychol.* 1998;27:168-179.
3. Rogers SJ, Vismara LA. Evidence-based comprehensive treatments for early autism. *J Clin Child Adolesc Psychol.* 2008;37:8-38.
4. Eikeseth S. Outcome of comprehensive psycho-educational interventions for young children with autism. *Res Dev Disabil.* 2009;30:158-178.
5. Myers SM, Johnson CP; American Academy of Pediatrics Council on Children With Disabilities. Management of children with autism spectrum disorders. *Pediatrics.* 2007;120:1162-1182.
6. Cohen H, Amerine-Dickens M, Smith T. Early intensive behavioral treatment: replication of the UCLA model in a community setting. *J Dev Behav Pediatr.* 2006;27:S145-S155.
7. Howard JS, Sparkman CR, Cohen HG, et al. A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Res Dev Disabil.* 2005;26:359-383.
8. Sallows GO, Graupner TD. Intensive behavioral treatment for children with autism: four-year outcome and predictors. *Am J Ment Retard.* 2005;110:417-438.
9. Zachor DA, Ben-Itzhak E, Rabinovich A, et al. Change in autism core symptoms with intervention. *Res Autism Spectr Disord.* 2007;1:304-317.
10. Matson JL. Determining treatment outcome in early intervention programs for autism spectrum disorders: a critical analysis of measurement issues in learning based interventions. *Res Dev Disabil.* 2007;28:207-218.
11. Remington B, Hastings RP, Kovshoff H, et al. Early intensive behavioral intervention: outcomes for children with autism and their parents after two years. *Am J Ment Retard.* 2007;112:418-438.
12. Harris SL, Handleman JS. Age and IQ at intake as predictors of placement for young children with autism: a four- to six-year follow-up. *J Autism Dev Disord.* 2000;30:137-142.
13. Weiss MJ. Differential rates of skill acquisition and outcomes of early intensive behavioral intervention for autism. *Behavioral Interventions.* 1999;14:3-22.
14. Perry A, Cummings A, Dunn Geier J, et al. Effectiveness of intensive behavioral intervention in a large, community-based program. *Res Autism Spectr Disord.* 2008;2:621-642.
15. Butter EM, Mulick JA, Metz B, et al. Eight case reports of learning recovery in children with pervasive developmental disorders after early intervention. *Behavioral Interventions.* 2006;21:227-243.
16. Reichow B, Wolery M. Comprehensive synthesis of early intensive behavioral interventions for young children with autism based on the UCLA young autism project model. *J Autism Dev Disord.* 2009;39:23-41.
17. Diagnostic and statistical manual of mental disorders, 4th edition, text revision. Washington, DC: American Psychiatric Association; 2000.
18. Granpeesheh D. Recovery from autism: learning why and how to make it happen more. *Autism Advocate.* 2008;50:54-58.
19. Helt M, Kelley E, Kinsbourne M, et al. Can children with autism recover? If so, how? *Neuropsychol Rev.* 2008;18:339-366.
20. Lovaas OI. Teaching developmentally disabled children: the me book. Austin, TX: Pro-Ed; 1981.
21. Maurice C, Green G, Foxx RM, eds. Making a difference: behavioral intervention for autism. Austin, TX: Pro-Ed; 2001.
22. Maurice C, Green G, Luce S. Behavioral intervention for young children with autism: a manual for parents and professionals. Austin, TX: Pro-Ed; 1996.
23. Eikeseth S, Smith T, Jahr E, et al. Outcome for children with autism who began intensive behavioral treatment between ages 4 and 7: a comparison controlled study. *Behav Modif.* 2007;31:264-278.
24. Jonsdottir SL, Saemundsen E, Asmundsdóttir G, et al. Follow-up of children diagnosed with pervasive developmental disorders: stability and change during the preschool years. *J Autism Dev Disord.* 2007;37:1361-1374.
25. Moore V, Goodson S. How well does early diagnosis of autism stand the test of time? Follow-up study of children assessed for autism at age 2 and development of an early diagnostic service. *Autism.* 2003;7:47-63.
26. Eaves LC, Ho HH. The very early identification of autism: outcome to age 4 ½-5. *J Autism Dev Disord.* 2004;34:367-378.
27. Lord C, Risi S, DiLavore PS, et al. Autism from 2 to 9 years of age. *Arch Gen Psychiatry.* 2006;63:694-701.
28. Fenske EC, Zalenski S, Krantz PJ, et al. Age at intervention and treatment outcome for autistic children in a comprehensive intervention program. *Analysis and Intervention in Developmental Disabilities.* 1985;5:49-58.